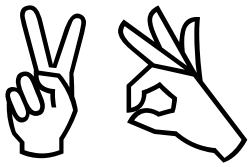

AP226 Expert Working Groups Workshop No.2
Held on 20-21 February 1997 at
Lloyd's Register House, Croydon, UK

Minutes of the Meeting

Present:

Z Bazari (Chairman)	Lloyd's Register (UK)
K Brownlie	Consultant (UK)
J Clayton	Stone Manganese Marine (UK)
P Fitzsimmons	Lloyd's Register (UK)
J Flarup	Odense Steel Shipyard (Denmark)
J Fransman	Kvaerner Masa-Yards (Finland)
J Freeman	Lloyd's Register (UK)
R Krapp	Germanischer Lloyd (Germany)
P Maillardet	Ministry of Defence (UK)
A Mechsner	HDW (Germany)
D Radosavljevic	Lloyd's Register (UK)
S Ruud	Det Norske Veritas (Norway)
J C Thomson	New Sulzer Diesel Ltd (Switzerland)
T Yaghmai	Bureau Veritas (France)

Apologies

M Barrett	Ministry of Defence (UK)
H Johansson	KaMeWa (Sweden)
H Longley	P&O Containers (UK)
T van Beek	Lips BV (The Netherlands)
B Taylor	British Marine Equipment Council (UK)

1. Welcome and Introduction

The meeting was opened at 11.00 am by Dr Z. Bazari, welcoming the participants and thanking them for their participation and review of documents. He passed on the apology on behalf of those who expressed interest in attending but could not do so because of other business engagements (see list above).

Participants then briefly introduced themselves and their organisations.

2. Minutes of Previous Workshop

The minutes of Workshop No. 1 were approved without amendment.

3. Actions Due to Workshop No. 1

A walkthrough of action list of Workshop No. 1 was conducted. It was agreed that all the actions have been completed (and that some of them will be discussed during the meeting).

4. Project Progress Statement

The following statement on AP226 progress was provided by Dr Z. Bazari:

- All actions of Workshop No. 1 have been completed.
- A new report entitled "Industry Review Report" on AP226 Data Dictionary (Part 1) has been prepared. All comments and issues raised by Industry Experts have been thoroughly investigated and included in the report.
- Breakdown Structure for Mechanical Transmission System has been significantly extended.
- Breakdown Structure for "Manoeuvring Systems" and "Connector" have been developed.
- High-level definitions for categories of Function, System, Mechanical Product and so on have been developed and documented.
- Liaison with external projects such as POSC/CAESAR and also ISO STEP continued.

5. Industry Review Report

It was reported that the completed "Request for Comment" on AP226 Data Dictionary (Part 1) has been received from 14 organisations. The responses and comments have been analysed, the result of which has been documented in the above report.

The report groups together the issues, comments and questions raised in the following order:

- Issues relating to AP226 Scope.
- Ship breakdown to mechanical system level.
- AP226 Methodology.
- Mechanical System breakdown to Functional Units.
- Diesel engine breakdown structure.
- Propulsor breakdown structure.
- Mechanical Transmission System breakdown structure.

The AP226 proposed solution to each issue has also been documented within the report.

The "Industry Review Report" was handed over to participants. A walkthrough of the report was then conducted, issues were discussed, together with decisions and actions (the list of decisions and action are given in sections 10 and 11 respectively).

The following issues came up in this session and were discussed:

- The question of whether AP226 supports large or small ships. The conclusion was that AP226 should be designed and developed such that to support all kind of ships.

- The question of spare parts and whether it will be supported by AP226. Again it was discussed that the AP226 methodology allows the representation of not only equipment but also components and parts and eventually should support spare parts.

- GL reported that they have established contact with German suppliers on AP226 and, although suppliers are not enthusiastic in supporting AP226, they have expressed keen interest to know about our progress. It was agreed that a closer involvement of suppliers would be advantageous for future development of the standard and policies for their involvement need to be developed.

6. Breakdown Structure of Manoeuvring Systems

The breakdown structure for manoeuvring system (as part of ship propulsion system) was presented by AP226 Team. This was discussed and the meeting agreed that a full review by participants is necessary.

7. Breakdown Structure of "Connector"

The issue of connectivity of various mechanical Units to each other and mechanical Units to ship structure is an important data exchange requirement. This has been raised frequently by participants in EWGs.

AP226 proposed the concept of "Connector" and its breakdown for this purpose. It was decided that two examples of such connectors together with their data to be investigated for discussion in the next meeting. Diesel engine connections to ship structure and to transmission system were selected for this purpose.

8. AP226 High-level Definitions

The AP226 Team presented a list of definitions. In particular, the concepts of Item, Mechanical Product, System, Unit, Component and Part were discussed. It was decided that all participants will review definitions and will provide the AP226 Team with their feedback.

9. Parallel Meetings of EWGs

The following EWGs were held their own meetings on 20 February 1997 (3.30 to 5.30 pm) and 21 February 1997 (11.30 am to 1.00 pm):

- EWG1 - Diesel Engine
- EWG2 - Propulsor
- EWG3 - Mechanical Transmission System

Minutes of these meetings are given in appendices 1 to 3 respectively.

10. Outline List of Decisions by Joint Meeting

The following list of decisions was agreed.

1. It was agreed that the followings are in the scope of AP226 although in some cases there may be no explicit reference to them in the scope.

   a) Propulsor control and monitoring systems.
   b) Hydraulic transmission system.
   c) Contra-rotating propellers and corresponding transmission systems.
   d) Sensors as integral part of machinery and equipment.
   e) Mechanical systems requirements for maintenance including space, tools and so on. The tools themselves and the design of engine room or engine routing spaces are out of scope of AP226.
   f) Electrical equipment and machinery which are integral part of ship mechanical systems.
   g) Condition monitoring systems for machinery and equipment are in the scope.
   h) Connectivity of mechanical Units to ship structure.
   i) Pumps including cargo pumps.

   All types of software are out of scope.

2. On the methodology, the current 'System View' with provision for support of major functional systems is considered to be sound and acceptable. Within this context, the strong view was expressed for AP226 to concentrate its effort in modelling basic Units while the aggregation of Units to various Functional Systems be given less priority.

3. Based on discussions on 'System and Function Views', it was agreed that the test of the developed breakdown will take place when data and attributes are tagged to units and components. This is the main subject for the next EWGs workshop. It was proposed by GL that the data and attributes for statutory and safety requirements of machinery, needs to be identified and incorporated.

4. The name for 'Fresh Water System' to be retained. The "Turbine (gas/steam)" from the list of Units of Auxiliary Systems to be removed as "Power Unit" will represent these units.

5. It was agreed that 'Hydraulic Transmission Systems' will be dealt with by the propulsor EWG and 'Contra-rotating Propeller Shafting System' by the transmission system EWG.

6. 'Exhaust Gas System' to be added to the auxiliary systems, in order to support large diesel engines.

7. All EWGs should follow the same procedure in their work.

11. Outline List of Actions

The following list of actions was agreed.

Code	Description	Action
EWG2.1	Future RFCs to be provided in electronic form in addition to paper form.	LR
EWG2.2	A statement on which part of Nuclear Steam Power plant to be out of scope to be prepared and forwarded to AP226 Team.	MOD
EWG3.3	GL's reference to ISO standard for definitions of components for reciprocating engines showed that time and resources can be saved if all the international and national background works on the subject could be identified and used. All the participants are requested to conduct a search on the subject within their area of expertise. The findings of this search are to be forwarded to AP226 Team.	ALL
EWG2.4	The 'Functional View' of ship mechanical systems leads to 'Functional Systems' in the hierarchical structure. All the participants should advise the AP226 Team of the 'Functional Systems' which they would like to be investigated in the standard. In doing so, please select them on the basis of your requirement for 'data exchange' rather than your internal information technology systems.	ALL
EWG2.5	The 'Breakdown Structure' for Manoeuvring System as proposed in the Addendum to Part 1 of Data Dictionary (document TID_PE5220_DD_addendum dated 20 February 1997) to be reviewed and comments back to AP226 Team.	ALL
EWG2.6	The 'Breakdown Structure' for "Connector" (in the Addendum above) to be reviewed and comments back to AP226 Team. Also AP226 definitions in Annex 1 of this document to be reviewed and comments back to AP226 Team.	ALL
EWG2.7	AP226 Team to prepare a couple of examples showing the use of "Connector".	LR

EWG2.8	The standard definitions for propulsor/propeller to be passed to AP226 Team.	SMM
EWG2.9	Scope of all the ship Application Protocols to be sent to Bureau Veritas.	LR
EWG2.10	The question of "deck machinery" and the proposed change to include cargo handling equipment to be investigated and proposed solution be presented to next workshop.	BV and LR
EWG2.11	The document on pre-installation data exchange scenario (reference: PE-5220-UG1 dated 20 February 1997) to be reviewed. Participants to propose how they can assist in defining the AP226 usage scenarios.	ALL
EWG2.12	Data and attributes for specific Units or Systems to be defined and documented for discussion in the next Workshop.	LR

For details of action list for each EWG, please refer to appendices 1 to 3.

12. Date and Place of Next Meeting

Next meeting is tentatively put for second half of either May or June 1997. The two-day arrangement was taken as being appropriate for next meeting. Next meeting will take place at LR Croydon, UK.

Appendix 1
Minutes of 2nd meeting of
AP226 Diesel Engine Expert Working Group
20-21 February 1997

Present: Z Bazari (LR - Chairman), J Fransman (KMY), A Mechsner (HDW), S Ruud (DNV), J Thompson (NSD) and T Yaghmai (BV),

This meeting took place on 20 February 1997 from 3:30 to 5:30 pm and on 21 February 1997 from 11:30 am to 1.00 pm at Lloyd's Register, Croydon, UK.

1. Introduction

Z Bazari opened the meeting with a brief presentation on the comments received by AP226 Team as a result of RFC on AP226 Data Dictionary (Part 1). He said that the majority of comments and issues have been documented in the "Industry Review Report" and will be the main subject of discussion by Diesel Engine EWG.

2. Minutes of Previous Meeting and Actions

The minutes of previous meeting were approved. Z Bazari informed the meeting that actions on data exchange scenario and type approval have been completed and will be further discussed in this meeting.

3. Discussion of Issues and Comments in the Industry Review Report

Most of the meeting time was devoted to discussion of issues and comments as documented in Section 7 of the "Industry Review Report" dated 20 February 1997. The decisions and actions which resulted from these discussions are are given in Sections 6 and 7 respectively.

4. Data Exchange Scenario

Possible pre-installation data exchange scenarios, with emphasis on diesel supplier - shipyard interaction were discussed, including:

- Exchange of engine technical specifications which: is between 5-10 pages and is needed by shipyards early in their machinery design phase.

- Exchange of dimensional models (2-D and 3-D): mainly CAD geometric drawing between supplier CAD System and shipyard CAD System.

- Exchange of technical data between suppliers and shipyard in order to electronically populate the data base for each new ship after the bid has been approved (database to database exchange).

- Data exchange between engine manufacturer and class society for type approval purposes.

It was agreed that the latter 3 scenarios need further investigation and clarification. For details of actions please refer to Section 7.

5. Data and Attributes

This was briefly discussed and it was agreed that AP226 Team will be assisted by NSD to identify data and attributes for diesel engine.

6. List of Decisions

1. The proposed breakdown by GL at level 2 for 'Main Gear', 'Control Gear' and 'Charge Air System' is taken as good grouping from functional point of view and accepted.

2. Operational supply systems as proposed by GL was not considered appropriate.

3. The 'Cylinder Head' grouping was changed to a new grouping under 'Engine Block' which would have cylinder head, cylinder block and crankcase as its sub-systems.

4. Turning gear and PTO/PTI assembly needs to be represented both under diesel engine and gearbox as they could be in either of the above units. The position of these units in the breakdown structure as proposed by GL was accepted.

5. Funnel will be renamed as 'Exhaust Pipe'.

6. Exhaust gas system to be added to 'Auxiliary Systems' with components from power turbine to exhaust pipe included in the breakdown. However, the 'Exhaust Gas System' to be represented as part of diesel engine as well for application with smaller engines.

7. Speed governor to be retained under 'Control Gear' but will be broken down to sub-systems if needed.

7. List of Actions

Code	Description	Action
EWG2.13	The "Type Approval" usage scenario to be investigated and documented.	BV
EWG2.14	The "New Building Machinery Database" exchange scenario to be investigated and documented.	HDW
EWG2.15	The exchange of machinery external geometry ("CAD Drawing") between supplier and shipyard, in terms of how it will be supported by STEP and by which Application Protocol to be clarified.	LR
EWG2.16	The agreed changes to Diesel Breakdown Structure and its definitions to be implemented.	LR
EWG2.17	Data and attributes for tagging to Breakdown Structure to be investigated and reported at the next meeting.	NSD/LR

Appendix 2
Minutes of 2nd meeting of
AP226 Propulsor Expert Working Group
20-21 February 1997

Present: K. Brownlie (WG Chairman, Consultant), J. Clayton (SMM)
P. A. Fitzsimmons (LR), D Radosavljevic (LR)

Apologies: H Johansson KaMeWa.

This meeting took place on 20 February 1997 from 3:30 to 5:30 pm and on 21 February 1997 from 11:30 am to 1.00 pm at Lloyd's Register, Croydon, UK.

Mr K. Brownlie opened the meeting and the following were discussed:

1. **Minutes of the Previous Meeting**

The minutes of the previous meeting were discussed and the members agreed that they were an accurate record of the discussion in the previous meeting.

Under matter arising, it was noted that 3 replies had been received from Far-East companies. The work undertaken at MIT in 1995, concerning the development of a STEP application protocol for marine propulsors was considered relevant for the EWG, and Mr Fitzsimmons agreed to distribute the text of this document within the Propulsor EWG.

2. **Propulsor Breakdown Structure**

The group considered the Section 8 of the Industry Review Report, TID_PE5220_IRR_1 (20/Feb./97) dealing with the comments received on the breakdown structure of the propulsor as a result of review since the last EWG meeting.

A change in the structure of the propulsor breakdown was considered, namely, breaking it down from the S13 level in Figure 1b of document TID_PE5220_DD1.0. In addition THRUSTERS were considered to be part of the manoeuvring system and hence it was recommended that they be moved to an 'ACTIVE' (or 'POWERED') branch of the MANOEUVRING tree under S14 of the above document.

The primary units below PROPULSOR would thus be

SCREW PROPELLER	(SP1)
PUMP PROPULSOR	(PP1)
AZIMUTHING PROPULSOR	(AP1)
CYCLOIDAL PROPULSOR	(CP1)

Responses to the Breakdown Issues were discussed and general agreement was obtained on all points, however, there was a feeling that the primary definitions of propeller, waterjet etc. could be further improved. The members agreed to consider these further and to communicate any changes.

The following major items were agreed under this section:

- "Tunnel thruster" will be part of manoeuvring system.
- "Azimuth Thruster" and "Azipod" to combine into "Azimuthing Propulsor".
- Propeller "Steering control mechanism" was changed to "Steering System".
- Contra-rotating propeller is a type of "Screw Propeller" and will be dealt accordingly.
- "Water-jet propulsor" and "Pump-jet propulsor" to be combined and named as "Pump Propulsors".
- Change "Electric motor" into "Drive motor".
- Certain definitions were agreed to become shorter. This will be implemented in the text.

3. **Pre-installation Data Exchange Scenario**

It was agreed that proposed scenario as documented in TID_PE5220_UG1, despite minor objections, would serve the purpose of identifying Functional Unit's attributes. Some of the comments and raised questions with regard to the content of the above document were:

- Owner is not the only organisation wich is involved in pre-installation phase but also consultants and ship managers.
- Classification Society is not usually involved during this stage.
- Shipyard does not deal with all of the aspects of the design, selection and so on; therefore it is more accurate to say that it is involved with some or all aspects.
- Do 'Documents' also include various certificates?
- Do test data (experimental, towing tank) belong to 'Engineering Analysis Data'?

4. Data and Attributes

It was felt that a list of manufacturers should be compiled and they should then be approached to specify what data they require during various stages of pre-installation phase and what data will they provide to the shipyard.

5. List of Actions

Code	Description	Action
EWG2.18	The new 'breakdown structure' of propulsor to be prepared.	LR
EWG2.19	The report by MIT on 'Propulsor Application Protocol' to be circulated to members of propulsor EWG.	LR
EWG2.20	SMM to list the data which they normally require during pre-bid to receipt of order phase.	SMM
EWG2.21	Contact KaMeWa and request the same information from them.	LR/KB

Appendix 3
Minutes of 2nd meeting of
AP226 Transmissions Systems Expert Working Group
20 - 21 February 1997

Present: J Freeman (LR - Chairman), R Krapp (GL), J Flarup (OSS), P Maillardet (MOD)

This meeting took place on 20 February 1997 from 3:30 to 5:30 pm and on 21 February 1997 from 11:30 to 1:00 pm at Lloyd's Register, Croydon, UK.

1. Industry Review Report

1.1 The Mechanical Transmission System Breakdown (Section 9) of the ***Industry Review Report*** was discussed and the proposed decisions were agreed subject to the following amendments:

a. Shaft Stern Seal To be moved from Level 3 (T1.4.5) to Level 2.
b. Franco Tosi Coupling To be referred to as 'Reversible Converter Coupling'.
c. Casing T1.1.3 For non-structural applications function to be more explicit.
d. Flexible Coupling T1.5.2 In description, replace 'tolerate' with 'accommodate, and replace 'alignment' with 'directions'.
e. Screw Shaft To be described as Propeller Shaft.
f. Muff Coupling - Flanged Type Description of this type to be provided before decision made on its inclusion.

1.2 During a wider discussion of the ***Industry Review Report*** the following issues were raised:

a. Interface with CPP System To be defined at coupling between oil distribution shaft and main shaft. CPP hydraulic system, oil distribution shaft, tubes and supports internal to shaft - all to be part of *Marine Propulsor*.
b. ISO Definitions Wherever possible these should be used for STEP component definitions.
c. Approach to Breakdown Structure As transmission system components appear in most mechanical systems in various combinations, it is proposed to adopt a 'toolbox' approach whereby a library (or 'toolbox') of components at Level 3 and below would be created. These could then be assembled to construct any desired transmission system, e.g. propulsion system, diesel auxiliary drive, compressor drive, purifiers, pump drive, etc. Systems of interest would be described to Level 2, in order to define/clarify the scope of the project.
d. Consistency of Approach with Related Industries Common methodologies should be adopted for the construction of data models, connectivity definitions, etc. for *Ship Mechanical Systems* and the mechanical systems developed by related industries.
e. Control System A 'black box' approach should be adopted. However,

control system A*ttributes* should define: controllable behaviour (max., min., transient response, etc.), operating modes, input data required from sensors, and signals to actuators. As control information will be transmitted from / to all components in a propulsion system, the Control System should be identified at Propulsion System level (S1) in the *Ship Mechanical System Breakdown Structure.*

f. Industry Involvement Much wider industry involvement (particularly by equipment manufacturers) is now needed to validate data models, usage scenarios, etc. To date, industry seems to be adopting a 'wait and see' approach, being unwilling to commit resources at this stage - we need to encourage a more proactive approach.
g. Connectivity With Ship's Structure Propulsion transmissions system will need connectivity data on structural stiffness for vibration analysis.
h. Connectivity with prime mover & propulsor / load Transmissions systems will need connectivity data from prime mover and propulsor / load for vibration and alignment analysis, e.g. mass / elastic data, excitation forces, propeller thrust and thrust offsets, etc.

2. Pre-installation Data Exchange Scenario

2.1 The data exchange examples provided in the *Pre-installation Data Exchange Scenario* document were discussed and the following amplifications were suggested:

a. Owner Requirements to award of contract, i.e. the 'tender process', to be further developed. Owners generally produce ship requirements (rather than specifications) which may include a preferred makers list. The process between generating a requirement and producing a specification, i.e. design development, is often evolutionary necessitating several exchanges of data at different levels. The distinct activities associated with 'Accepting' the ship should be included.
b. Classification Society Approves design in accordance with Classification Rules. May also act on behalf of Flag State for certification of national / international requirements. Type Approval data exchange could also be included.
c. Shipyard Refines structural design to accommodate machinery; may also refine machinery design in conjunction with machinery manufacturers to meet specific requirements. Prepares extensive and detailed specification. Exchanges data with consultants, Classification Society, owner and various maritime authorities.
d. Suppliers Refines machinery design in conjunction with shipyard.
e. Maritime Authority Could be added as organisation requiring STEP data exchange.

2.2 Data exchange scenarios beyond the pre-installation phase were also discussed. These should include: through life support, structural alterations, equipment modifications, and disposal (i.e. 'Integrated Logistic Support' - ILS).

3. Outline List of Actions

The following actions are proposed with reference to above paragraphs:

Coded	Description (please refer to text)	Action
EWG2.22	1.1.a. to 1.1.e.	JF
EWG2.23	1.1.f.	RK
EWG2.24	1.2.a.	JF & KB
EWG2.25	1.2.b.	JF
EWG2.26	1.2.c.	JF
EWG2.27	1.2.d.	ZB
EWG2.28	1.2.e.	ZB
EWG2.29	1.2.f.	ZB & JF
EWG2.30	1.2.g.	ZB
EWG2.31	1.2.h.	ZB, JF, KB
EWG2.32	2.1.a to 2.1.e	ZB
EWG2.33	2.2	ZB

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